

What is claimed is:

1. A fuel system for a gas turbine engine including a gas generator and an augmentor located downstream from at least one fuel source comprising:

5           a gas generator fuel system comprising a first fuel line and a first fuel metering valve in said first fuel line;

          an augmentor fuel system comprising a second fuel line and a second metering valve in said second fuel line;

          a diverter valve in said second fuel line downstream from said  
10          second metering valve; and

          a third fuel line connected between said diverter valve and said first fuel line.

2. The fuel system of claim 1 wherein said third fuel line is connected to said first fuel line downstream of said first metering valve.

15          3. The fuel system of claim 2 wherein said gas generator fuel system includes a first shutoff valve in said first fuel line downstream of said first fuel metering valve and said augmentor fuel system includes a second shutoff valve in said second fuel line downstream of said second metering valve.

20          4. The fuel system of claim 2 wherein said third fuel line connects to said first fuel line downstream of said first shutoff valve.

          5. The fuel system of claim 3 wherein said diverter valve is located downstream of said second shutoff valve.

          6. The fuel system of claim 2 including a controller for controlling  
25          said first metering valve and said second metering valve.

          7. The fuel system of claim 3 including a controller for controlling said first metering valve, said first shut-off valve, said second metering valve, said second shut-off valve and said diverter valve.

8. The fuel system of claim 6 wherein said controller monitors an operating condition of said first metering valve.

9. The fuel system of claim 6 wherein said diverter valve is positioned to direct fuel to said gas generator during a normal operating condition of the gas turbine engine.

10. The fuel system of claim 6 wherein said diverter valve is positioned to prevent fuel in said diverter valve from reaching said gas generator during a normal operating condition of the gas turbine engine.

11. The fuel system of claim 3 including a controller for controlling said first metering valve and said second metering valve and said diverter valve, wherein said controller, upon detecting a failure of said first metering valve, closes said first shut-off valve and causes said diverter valve to allow an increase fuel flow to said first fuel line.

12. The fuel system of claim 2 wherein said first metering valve and said second metering valve jointly regulate the amount of fuel flowing to said gas generator.

13. The fuel system of claim 12 wherein said controller controls said second metering valve to increase or decrease fuel flow to said gas generator when a decrease or increase in fuel flow through said first metering valve is detected.

14. The fuel system of claim 12 wherein said controller controls said first metering valve and said second metering valve to maintain a substantially constant metered flow of fuel to said gas generator.

15. The fuel system of claim 3 wherein said augmentor fuel system comprises an augmentor fuel control downstream of said augmentor fuel pump comprising a plurality of metering valves controllably delivering fuel to the augmentor, wherein said diverter valve is located downstream of

one of said plurality of metering valves controllably delivering fuel to the augmentor.

16. The fuel system of claim 3 wherein said augmentor fuel system comprises an augmentor fuel control downstream of said augmentor fuel pump comprising first and second branches of said second fuel line and first and second metering valves in said first and second branches controllably delivering fuel to said augmentor, wherein said diverter valve is located downstream of said second metering valve and controlled by said first metering valve.

17. In a gas turbine engine having a gas generator and an augmentor, a method of providing a secondary fuel supply to the gas generator comprising the steps of:

- providing a first metering valve metering fuel to the gas generator;
- providing a second metering valve metering fuel to the augmentor;
- providing a diverter valve downstream of the second metering valve; and
- selectively diverting fuel from the diverter valve to the gas generator.

18. The method of claim 17 including the additional step of controlling an amount of fuel diverted from the diverter valve to the gas generator.

19. The method of claim 17 including the additional step of monitoring a condition of the first metering valve and changing the amount of fuel diverted to the gas generator in response to a change in the monitored condition.

20. The method of claim 17 wherein said step of selectively diverting fuel from the diverter valve to the gas generator comprises the step of diverting no fuel from the diverter valve to the gas generator during a normal operating condition.

21. The method of claim 17 wherein said step of selectively diverting fuel from the diverter valve to the gas generator comprises the step of diverting fuel from the diverter valve to the gas generator during a normal operating condition.

5           22. The method of claim 17 including the additional step of controlling the diverter valve to provide to the gas generator an amount of fuel equal to a difference between an amount of fuel required by the gas generator and an amount of fuel provided by the first metering valve.

10           23. A method of providing a secondary fuel supply to a gas generator section of a gas turbine engine having a gas generator section and an augmentor section, a first fuel line delivering fuel in a downstream direction to the gas generator section and a second fuel line delivering fuel in a downstream direction to the augmentor section comprising the steps of:

15           providing a first metering valve in said first fuel line;  
              providing a first shutoff valve in the first fuel line downstream of the first metering valve;  
              providing a second metering valve in said second fuel line;  
              providing a second shutoff valve in the second fuel line  
20           downstream of the second metering valve;  
              providing a diverter valve in the second fuel line downstream of the second metering valve;  
              connecting the diverter valve to the first fuel line downstream of the first shutoff valve;  
25           monitoring a condition of the first metering valve; and  
              controlling the amount of fuel diverted from said second fuel line to said first fuel line in response to a change in the monitored condition.

              24. A fuel system for an aircraft gas turbine engine including a gas generator section and an augmentor section comprising:  
30           a fuel supply;

a boost pump drawing fuel from said fuel supply;

a gas generator fuel system connected to the boost pump and including a first fuel pump, a first nozzle directed into the gas generator section, a first fuel line delivering fuel in a downstream direction from the fuel pump to the first nozzle, a first metering valve in said first fuel line  
5 upstream from said first nozzle and a first shutoff valve in said first fuel line between said first metering valve and said nozzle;

an augmentor fuel system connected to the boost pump and including a second fuel pump, a second and third nozzles directed into the augmentor section, a second fuel line comprising first and second  
10 branches delivering fuel in a downstream direction from the second fuel pump to the second and third nozzles, a second metering valve in the second fuel line first branch upstream of the second nozzle, a second shut-off valve in said second fuel line first branch between said second  
15 metering valve and said second nozzle, a third metering valve in the second fuel line second branch upstream of the third nozzle, a third shut-off valve in said second fuel line second branch between said third metering valve and said third nozzle,

a diverter valve downstream of said second metering valve;

an auxiliary fuel line connected between said diverter valve and said  
20 first fuel line; and

a controller for controlling said first metering valve, said second metering valve and said third metering valve, said controller causing said first metering valve to deliver a precisely controllable amount of fuel to  
25 said gas generator and controlling the amount of fuel diverted by the diverter valve into the first fuel line.

25. The fuel system of claim 24 wherein said diverter valve is controlled by said third metering valve.